Did the Gray whale, *Eschrichtius robustus*, calve in the Mediterranean ?

by Matthias Macé

Introduction

Great size bones were dug out from Lattes archæological excavations and were therefore presumed to be from Cetacea species. A rapid glance reveals that we are in presence of three great whale's vertebræ, a rib fragment, and a skull fragment : the incisive portion close to the bony blowhole (maxillary-incisive fragments). Two of these bones present signs of human alteration. The main interest for studying these bones is to know if they are from a Mediterranean contemporary or extinct whale species. It is actually known that Fin whale is the most common species in the Mediterranean, followed by Sperm whale at lesser extend and at a minor frequency, the Minke whale. In addition, other great whales, as the Humpback whale, the Northern Right whale, the Sei and Bryde's whale, occasionally wander in those waters by historical or actual times (Beaubrun 1995). We cannot presume whether the relative species abundance evolved during the times or that the actual situation was the same at the Roman empire's epoch.

One of the most important factors for whale extinction is human predating (whaling). From no doubt ancient times, humans, especially those who live more or less along shores, preyed upon whales. Whatever those people only took advantage of stranded animals or hunted actively for these leviathan is unknown but actual «native» people from the Arctic, without oversight of the native American, show that this hunting is ancestral. That could explain the numerous source of subfossil bones as perhaps it might be the case for the site of Lattes. Therefore, the present study will focus on the so-called modern whaling that began with Basque, Viking and Icelanders. Basque people began to hunt for whales in the Bay of Biscay as early as the Xth century (Fischer 1872). It is usually considered that their prey was the «Baleac» (in Euskarra) *Eubalæna glacialis* (ex - *Balæna biscayensis*), Northern Right or Black whale of the English-speaker whalers (that became the usual name) or «Nordkaper» of the Dutch whalers. But by the light of today's knowledge, various witnesses show discrepancies on the descriptions not only of anatomical characteristics but also of life history and behaviour. We cannot therefore exclude the presence of other prays in the early Basque whaling, e.g. Humpback, Finback or Gray whales that could frequent the Biscayan waters. From immemorial time, whales have been hunted on Icelandic coasts as witnessed by an Icelandic manuscript from the XIIth century, *Kong-skug-sio* the Royal Mirror. We know from this last that Icelandic people distinguished the «Nordwall», *Balæna mysticetus*, that wintered in their waters, from the «Sletbag», *Eubalæna glacia - lis* that appeared in summer. We now know that the synchronicity of these whales migrations avoided their meeting in Icelandic waters.

The Basque whalers knew their glory hour from the Xth up to the XVIth century. Then they were considered to have destroyed the Bay of Biscay wintering stock, and moved westward. They are now supposed to have reached New England and Terre-Neuve Banks in 1372 (Fischer 1872). There, they found whales in abundance, slightly different from theirs, so they called them «Sardaco Baleac» («Whale that goes in troups»). They also entered the St Lawrence bay and found a whale therefore called «Grand Bayaco Baleac» («Whale from the Great Bay») which is supposed to be the Bowhead whale, *Balæna mysticetus*. The first was until now supposed to be the Right whale but if we read carefully Fischer's and other's narratives, we can see doubtful descriptions as «None is sure that the *Sardaco baleac* is identical to the Biscayan whale […] a little thinner […]». There are also various accounts of the mythic «Scrag whale» that none can ascertain the identity (the gregarious behaviour of the whale with its aspect tends to confuse the identification between Right whale and Humpback or a possible Atlantic Gray whale).

Then, Dutch whalers put an end to Basque «monopoly» on whaling, opening the door for American, Nordic and British whalemen. Therefore began another whaling epoch much more com-

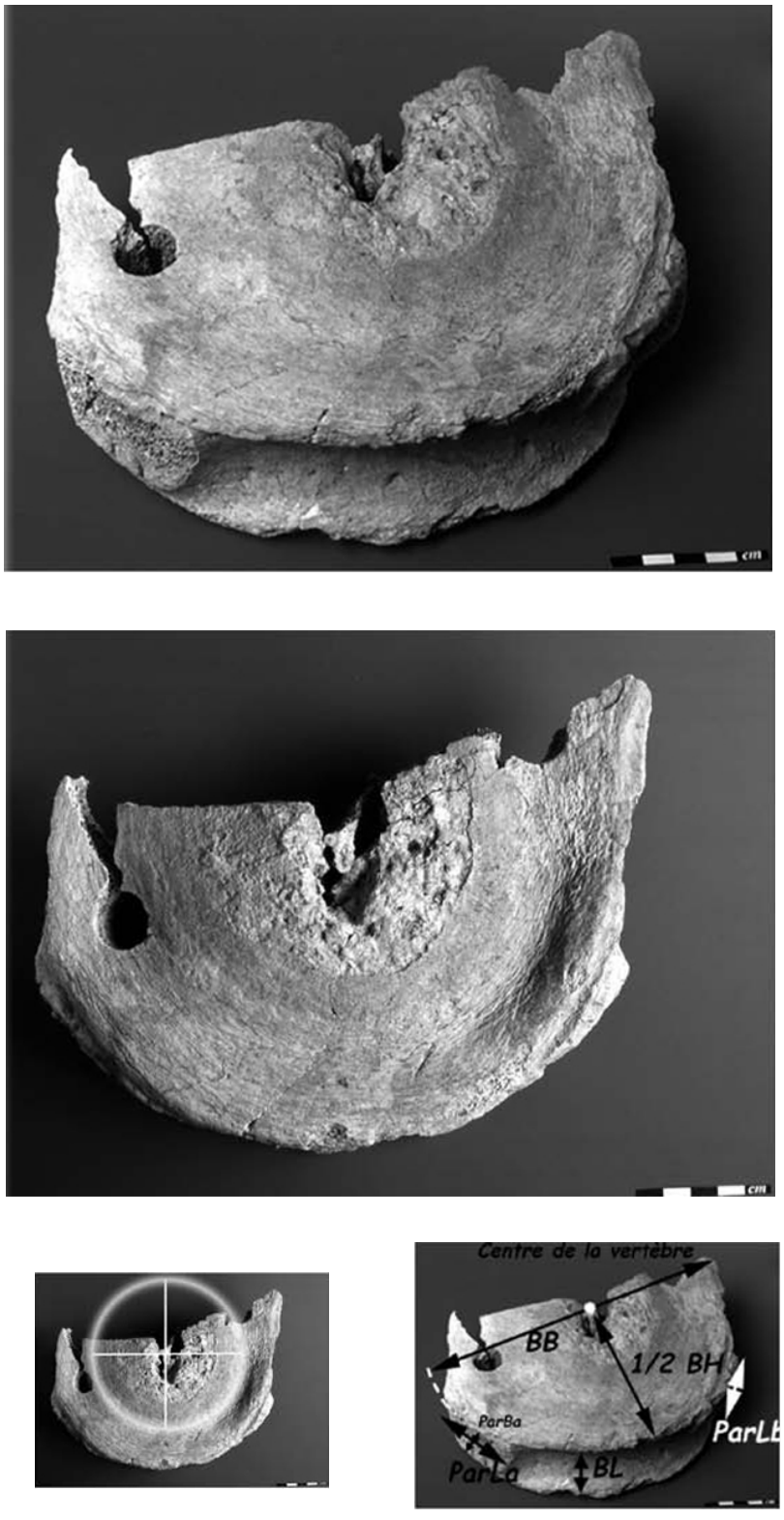

Fig. 1 : Third or fourth Cervical vertebra (Photograph courtesy of L. Damelet). Top: oblique view ; Middle: cranial view ; Bottom left: approximation of the vertebra centre ; Bottom right: measurements.

mercial (see Figure 7 after Scammon 1874) that led various species (not only whales but also other marine Mammals) to the edge of extinction or to the properly said vanishing. We could cite †Steller's Rythine (*Hydrodamalis gigas*), Atlantic Humpback *Megaptera novæangliæ*, both Atlantic Right whales *Eubalæna glacialis* and *Balæna mysticetus*, worldwide Blue whale *Balænoptera musculus*, etc…

The aim of our work is to elucidate the origin of the bones dug out in Lattes : from a Mediterranean contemporary or extinct whale by a standard comparative anatomy study.

Material and methods

The material is composed of a set of five anatomical pieces more or less fragmented coming from different areas of the *Lattara* city : areas 16, 22, 27, 104 and 123. We can identify at a glance three vertebræ, one rib and numerous fragments from a snout. One of them was dug out from the «Place 123» : a rib portion (two fragments) from sector 4, Us 123049 dated 375-350 BC.

The bones were studied by classical comparative anatomy methods : anatomical shape description, comparisons with references and osteometry. The references for the skeletons were from various authors, (van Beneden and Gervais 1880 ; Lilljeborg 1867 ; True 1904), and two actual local species skeletons (from *Balænoptera acutorostrata* at the Ecole Nationale Vétérinaire, Toulouse, France, and *Balænoptera physalus* coll. J.-L. Fabre, Port-la Nouvelle, France, together with another locally disappeared whale *Balænoptera musculus* in the Muséum d'Histoire Naturelle, Perpignan, France).

The osteometric measurements were made according to Crovetto (Crovetto 1982) methods and compared with his diagnosis key and osteometric data. The set of measurable dimensions was so poor that we had to make extrapolations such as right-left side mirror images and bone centre localisation by tangential methods.

Results

1st vertebral piece (Figure 1)

The specimen is limited to the ventral two-thirds of the body. It is broken in such a straight way that makes sure it is human caused. It also bears one hole and another half one, all together following the cranio-caudal way. The vertebra body is short, flattened cranio-caudally with its ventral side dug out by

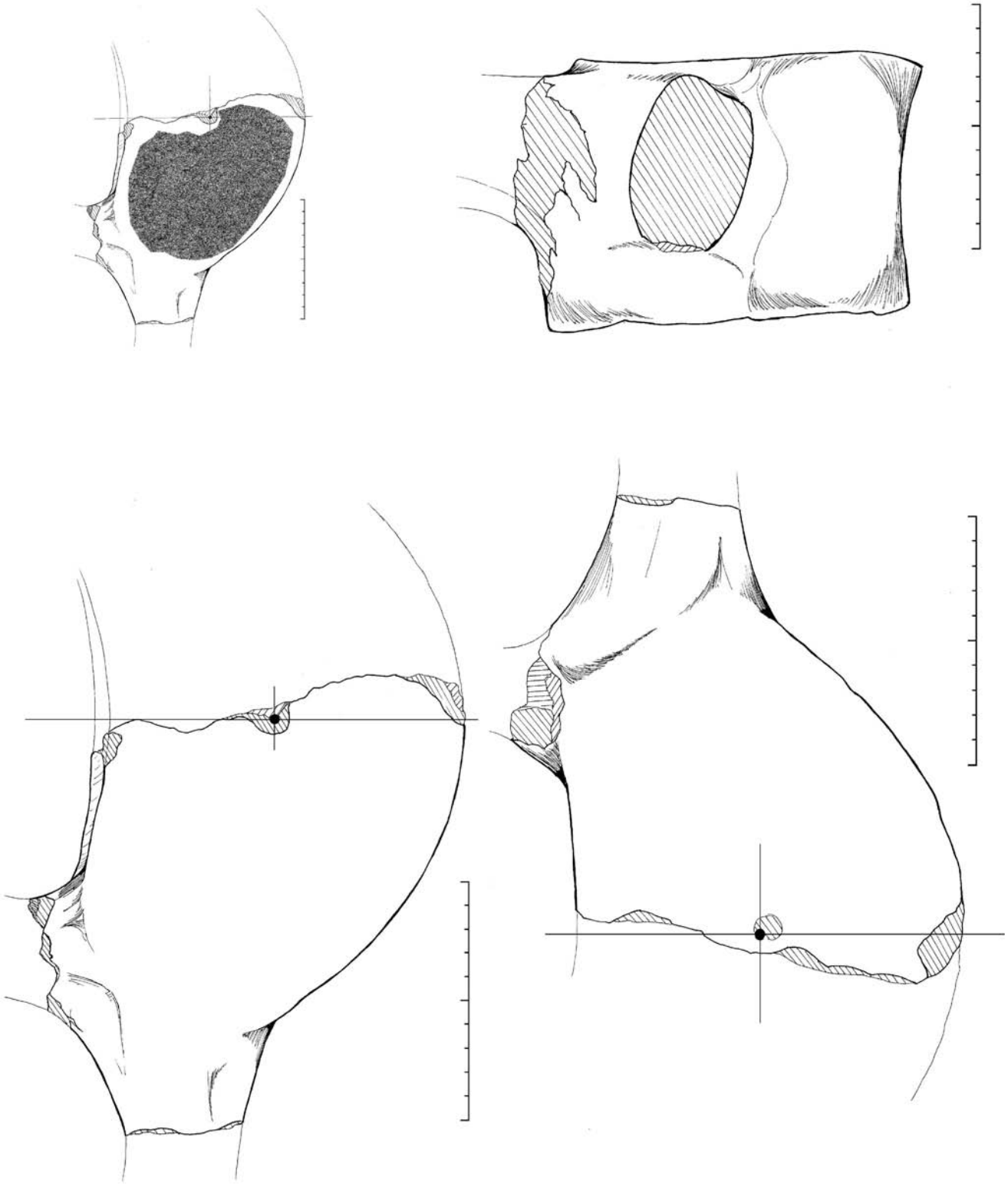

Figure 2. Cranial Thoracic vertebra. Top left: cranial view ; Top right: outline of the growth cartilage ; Bottom left: caudal view ; Bottom right: lateral view.

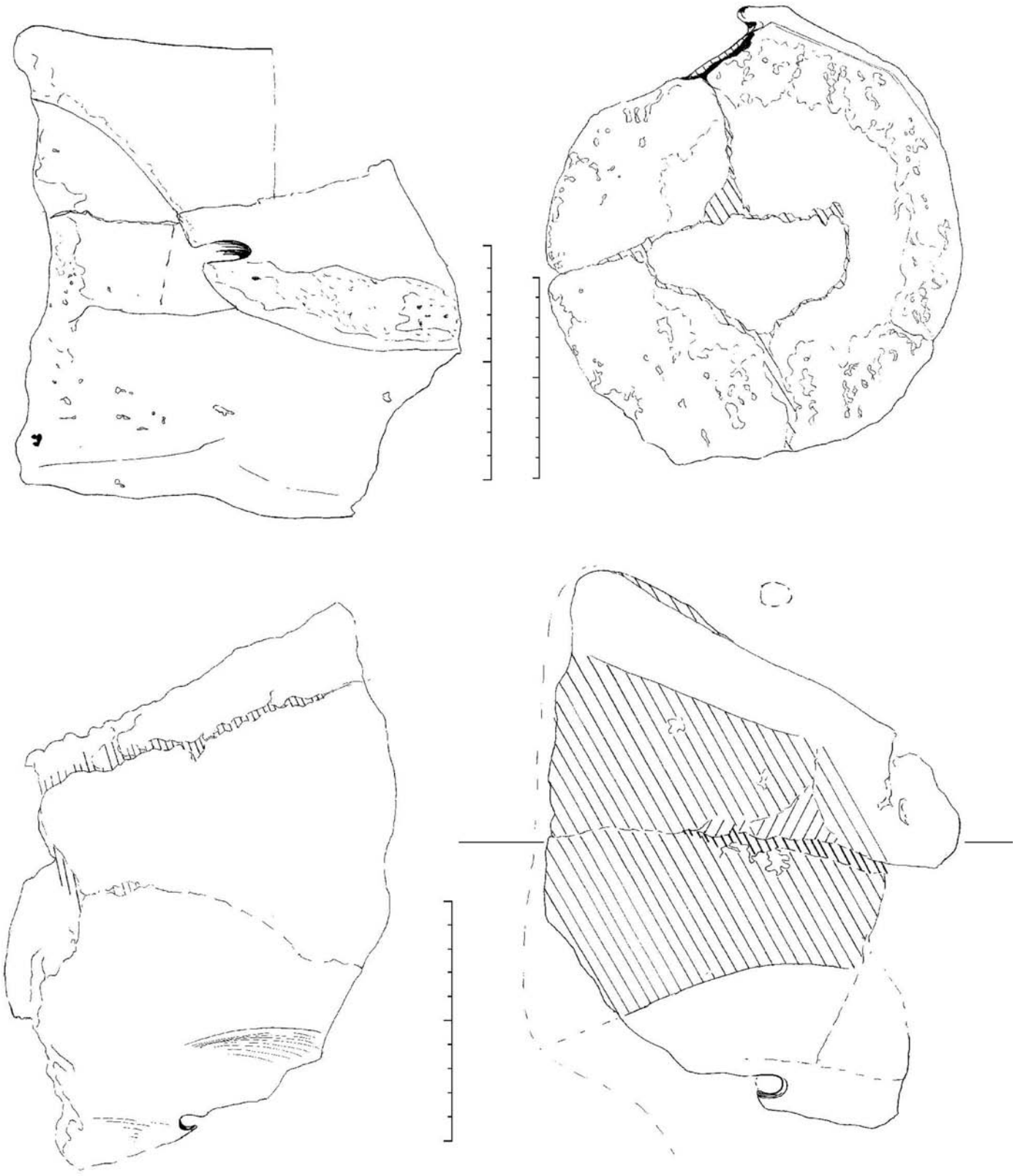

Figure 3. Anterior Caudal vertebra. Top left: ventral view ; Top right: lateral view ; Bottom left: dorsal view ; Bottom right: cranial view.

a deep transverse furrow limited by the circular epiphysis' edge. At the ventro-lateral angles are two broken processes, birth of what some authors call «zygapophysis» better called ventral or zygoïd processus (Crovetto 1982 modified following the Nomina Anatomica Veterinaria, I.C.V.G.A.N.W.A.V.A 1983). According to these discrepancies, we should prefer to propose to the I.C.V.G.A.N.W.A.V.A the new term «paraprocessus». We are therefore in presence of a whale (Mysticete or Physter) cervical vertebra. Moreover, the paraprocessi are strong and cranio-caudally flattened.

The osteometric data are the following : estimated (est.) Body Breadth (BB) = 217 ± 10 mm ; est. Body Height (BH) = 224 ±20 mm ; Body Length (BL) = 60 mm ; Greatest (ventro-dorsal) length of paraprocessus = 58 mm (left) 62 mm (right).

Because the bone is free and does not form a block with other bones, it cannot be neither a Right whale (Balænidæ) nor a Sperm whale (Physeteridæ), both species bearing fused cervicals. Given the great development of the paraprocessus, it is clearly a 3rd, 4th or 5th cervical vertebra of a Balænopteridæ or Eschrichtidæ. According to the Crovetto's diagnosis key, we lack some main characters (neural arch and lateral processus) so we have to test every remaining branch of the key with the available data :

– the easier way is to consider that the paraprocessus basis is strong enough (more than 50 mm in its greatest width) to consider that it belongs to the Gray whale *Eschrichtius robustus* according to the description of the European form made by Lilljeborg (Lilljeborg 1867) and our personal observations carried out on the two Mediterranean Balænopterid reference skeleton afforded by Fabre's collection and Perpignan's Museum that shows a thinner and triangular-shaped paraprocessus basis;

– the other way is to explore all Balænopterid's key branches. Here again we need to leave out some necessary data and must argue only with bone dimensions among which some are estimated. Follo-

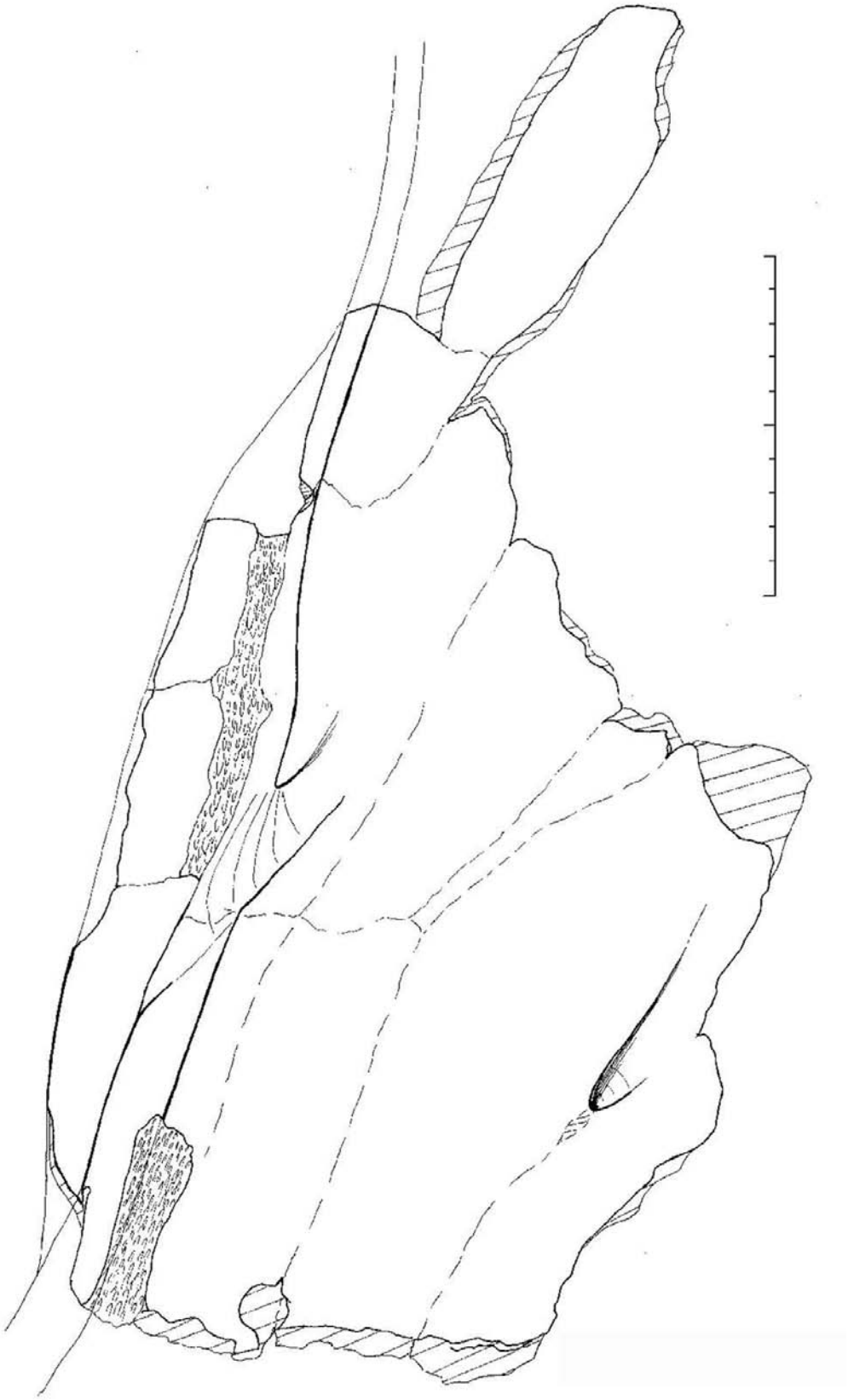

Fig. 4. Bony blowhole fragment. Bony piece composed of parts of the right incisive and maxillary (scale = 10 cm).

wing this way, *Balænoptera musculus* can be excluded, because the C quotient (C = body breadth / body length = 3,45-3,78) is under this species values (3,9-4,6). and *Balænoptera edeni* (which C value could correspond) because the specimen is wider and especially higher. *Balænoptera acutorostrata* which species could correspond in terms of development of the paraprocessus, is also excluded because of the specimen's much greater size. Therefore remain the following species : *Megaptera novæangliæ*, *Balænoptera physalus* and *Balænoptera borealis*. The shape of the former's paraprocessus does not fit very well according to True's photographs (True 1904) whereas there are doubts for the two last Rorquals : their corresponding bones are about one-and-half wider (275-340 mm) than high (180-225 mm) and in absolute, Fin whale's bone is wider than the specimen. Given both methods, we can ascertain with little doubt that this vertebra belongs to the Gray whale species.

2nd vertebra piece (Figure 2)

Once more, the bone is reduced to the body (in fact a little more than half the body) with 30-40 mm of the lateral processus and 20 mm of the lateral lamina (Figure 2.). It is noticeable that the epiphysis is not fused. The bone can be orientated : according to the caudal location of the deeper vertebral notch, it is the right side. An extrapolation from the right half reveals that the body's epiphysis (in fact the growth cartilage) is heart-shaped, the tip being situated on the ventral side. On this side is present a shallow annular depression slightly compressed cranio-caudally that runs all around ventral and lateral sides. It seems, given the bone condition, that there is no ventral keel at the downiest part. The lateral processus shape is oval and strong, its cranio-caudal breadth being about 2/3 the vertebra's length (excluding the epiphysis) and its height being about 3/5 the vertebra's breadth. The lateral lamina basis has roughly the same shape and size as the lateral process, with the addition of a smoothly downing caudal edge corresponding to the vertebral notch.

The osteometric data are the following : est. BB = 230-250 mm ; BH = 148 mm ; est. BL = 110-120 mm ; est. cranio-caudal length of the lateral lamina = 70-80 mm ; est. cranio-caudal breadth of paraprocess = 75 mm; dorso-ventral height of paraprocess = 55 mm and est. Neural canal width (NW) = 110-130 mm.

The Crovetto's diagnosis key does not allow any conclusion given the bone fragmentation but we can compare the osteometric data with Crovetto's ones. In our specimen, the calculation gives the following ratios : $0,59 \leq BH/BB \leq 0,64$ and $0,42 \leq NW/BB \leq 0,54$. The closest ratios would correspond to the second thoracic vertebra of Lilljeborg's European Gray whale. The following nearest ratio calculations are for the sixth thoracic vertebra of the Blue, Bryde's and Humpback whales but they do not match very well and in addition, the specimen seems to fit better with a more cranial vertebra given the lateral process' rectangular shape.

3rd vertebral piece (Figure 3)

This great size material is composed of three main parts (one greater and two lesser), and numerous fragments that fit between them. After reconstitution, the obtained specimen is a very damaged vertebra that seems in addition to have been hollowed out for human purposes on one epiphysis. It is difficult to give the cranio-caudal bone orientation but we can distinguish : a hollowed out epiphysis (cranial or caudal ?), a dorsal side with the neural arch that looks like sawed off, only letting a regular flat area, a lateral side with the half of the lateral process basis (the other side is completely destroyed) and a ventral side so damaged that nothing more can be said.

The main characteristics that can give a diagnosis is the presence of a foramen that perforates cranio-caudally the lateral process basis. This is only present in Balænopteridæ's firsts caudal vertebra. But the following very roughly estimated measurements: BB = 260 mm, BH = 260 mm, NW = 50-70 mm seems to fit better with *Eschrichtius robustus* or *Balænoptera edeni* (unless it could be a young *Balænoptera physalus*).

Rib portion (Figure 5)

Two fragments, corresponding with each other, form a part of the inner longitudinal half of a Cetacean rib. Given the fact that rib's width variation does not follow the bone's great diameter variation (see osteometry below), we can suppose that it is not one of the first (cranial) ribs. So we can hypothesise that the widest extremity (top of the figure) is dorsal while the narrower (foot of the figure) is ventral. The curve degree leads us to think it corresponds to the middle part of the rib.

Usually, Balænopteridæ's ribs present cranial and caudal ridges unlike the other Baleen whales so the shape of our specimen does not fit with a Rorqual. Moreover, the shape is more similar to those of Balænidæ and Escrichtidæ that is more rounded.

The osteometric data are the following : estimated greatest (cranio-caudal) diameter of the lower end = 65 mm, estimated greatest (cranio-caudal) diameter of the upper end = 50 mm, estimated breadth at lower end = 40 mm, estimated breadth at upper end = .40 mm.

The anatomical data then suggest that this bone could pertain to species actually not present in the Mediterranean (Balænidæ or Eschrichtidæ).

Blowhole (incisive and maxillary bones) *portion* (dramatically fragmented, Figure 4)

The flat fragment studied has a trapezoïd shape with the greatest edge few fragmented corresponding to a natural cavity and all other edges being broken. By the natural opening's shape (ridge triangular in its cranial end vanishing in its caudal end, leaving a more irregular ridge surrounded on one side by the natural opening and on its other side by a vanishing furrow ; flatness slightly concave ; presence of an arterial foramen on the opposite half) we are able to say that it is, with the maximal probability, the middle part of the left lateral edge of the bony blowhole formed by the incisive and the maxillary. The other possibility is that it could be

the cranialmost part of the right bony blowhole margin but the probability is low.

The bony piece being very fragmented, the reconstitution tends to hide the incisive-maxillary suture and does not help for the concavity degree valuation. Given the flatness, we can exclude both *Physeter* and the Balænidæ. The size excludes the possibility of a *Balænoptera acutorostrata*. If we have a look to the Balænopteridæ museum models, we are able to distinguish our specimen from them given three main characteristics : the absence of convexity in a transversal section, the blowhole's edge crossed by a one-finger shaped furrow well separating a cranial smooth edge from a caudal crest, and the rough surface formed by the medialmost thickening edge. It seems that the Gray whale, *Eschrichtius robustus*, skull fits better than any other species does with the blowhole's edge shape. However, the flatness of the bone seems to fit better with *Balænoptera physalus* or *musculus*. The low probability possibility would fit with *Megaptera novæangliæ* (but it is quite impossible because of the own edge shape).

Osteometric data : littlemost distance between the blowhole's edge and the vasculo-nervous opening = 135 mm.

Discussion

These bones rise many questions, the main being about the whale species. Was this species autochtonous or not ? Then did these whale bones come from the Gulf of Lions or further, as the Atlantic ocean ? Was the whale death human caused or not ? Was it used for human purposes ?

We have to elude the questions about the geographic origin because we have no means to check it. The death cause is also cautious but there are only two possibilities : shore stranding or hunting. We are unable to state precisely the use but it is of interest to note that the bony blowhole fragment presents signs of burning (e.g. for oil yield), that a vertebra has been used as a domestic furniture. These bones could belong to a coastal species so traditionally used or fortuitously.

The comparative anatomy study allows us to give probabilities of species diagnosis of which we will discuss the main : *Eschrichtius robustus*. Then we have to confront with ecological and historical likelihood.

Among all studied morphological characters is rising a great majority in favour of the Gray whale, *Eschrichtius robustus*. According to True (True 1904), Gray whale bore various names all over the times :

Eschrichtius robustus (robusta ; gibbosus) Lilljeborg 1861
Rhachianectes glaucus Cope 1869
Agaphelus glaucus Cope 1868 (based on California specimen)
Agaphelus gibbosus Cope 1868 (based on Dudley's «Scrag whale»)
Balænoptera robusta Lilljeborg 1861 (based on Swedish subfossil)
Balæna gibbosa Erxleben 1777 (based on Dudley's «Scrag whale»)

It actually only remains one Pacific population along West American coasts and another little group found in the waters of Korea and Japan (Rice and Wolman 1971).

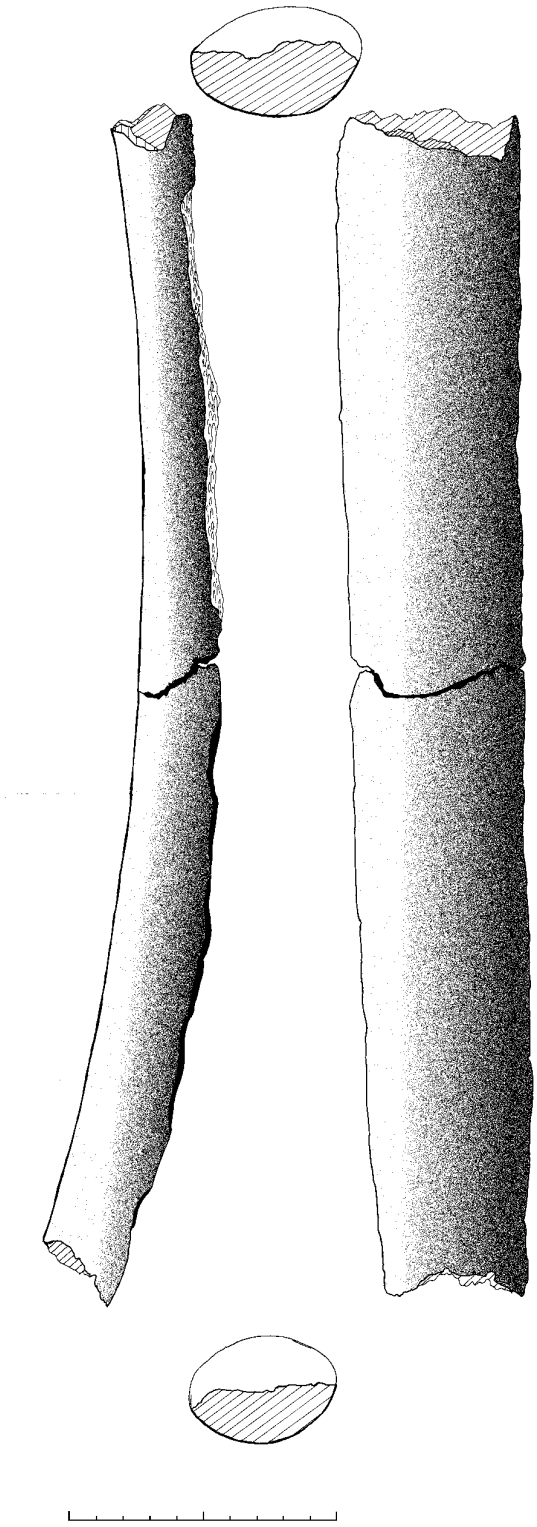

Fig. 5 : Rib fragments. Two rib fragments that correspond to a part of the inner half of a rib. The widest extremity (top) is ventral while the narrower (foot) is dorsal. Left: cranio-caudal view ; Right: medial view ; Top and bottom: transverse sections.

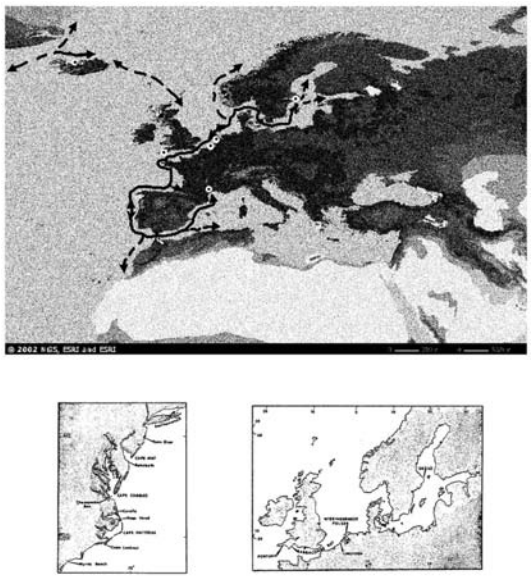

Fig. 6. Possible migration routes. Top: Possible migration route along European coasts (filled strokes: as hypothesised by archæology ; dash strokes: other possibilites ; circled areas with black dot: historical presence of Gray whales. Bottom left: Remains of Gray whales found along U.S. eastern coast ; Bottom right: Remains of Gray whales found along north European coast.

However, this whale is one of the few animals, with the Cœlacanth, that have been described by archaeological remains (in Europe, see below) before European and Yankees whalers discovered it in California. Was it justificable to confound both Atlantic and Pacific forms into a single species ? Molecular studies could help to resolve the question.

The Pacific Gray whale has a mean size of 12,97 ± 0,11 m for females and 12,43 ± 0,12 m for males. Gray whales are considered to feed upon gammaridean amphipods (close to shrimps) of the families Ampeliscidæ, Aoridæ, Lyssianassidæ, Eusirinidæ, Atylidæ and Gammaridæ ranging from less than 6 to 25 millimetres in length (Rice and Wolman 1971). The main prey is *Ampelisca macrocephala* for the Northernmost migrating and *Atylus carinatus*, for the others but a great variety of benthic animals are consumed (Decapod Crustacean, Polychætes, etc…). *Ampelisca macrocephala* occurs mainly on sandy bottoms at depths of 5 to 300 meters (Kanneworf 1965) in cold waters of at least Bering and Baltic Seas (and probably elsewhere). It is therefore considered that Gray whales only feed in high latitudes (Rice and Wolman 1971) but some authors have reported few observations of feeding off Washington (Weitkamp 1992) and California (Avery and Hawkinson 1992). They could also prey upon pelagic species : kelp leaves and/or *Euphasia pacifica*, an Euphausiidæ Crustacean, this last being the main prey of Rorquals especially in the Mediterranean (Beaubrun 1998).

Gray whales will weight about 15-35 tons (up to 50 in late pregnant females) and it is interesting to say that their weight loss ranges from 11 to 29 % between southward and northward migrants (Rice and Wolman 1971). That explains why industrial whaling focused on wintering grounds where animals are more fatty. Female Gray whales give birth under lower latitudes (California and Korea). Calves are weaned at about eight months, after going back with their mothers to the summer upper latitudes feeding grounds (Rice and Wolman 1971) where the biomass of bottom-dwelling organisms explodes under light and warming effect. Some authors (Klaus 1990) consider that Gray whales plays a fundamental role in the benthos regulation in upper latitudes. As fall approaches, the whales travel towards Baja California, where they enter lagoons to give birth and mate. Gray whales have one of the longest migrations of any Mammal : they travel about 8000 kilometers, distance that would correspond to a Baltic-Northwestern Mediterranean trip. Thus, one can easily wonder the difficult trip that could represent passing Denmark straits, the English Channel, Gibraltar strait, all zones where whales could have been very disturbed and even hunted (Fischer 1872) by humans. There is no doubt that ecological conditions changed a lot since proto-historic times. Human community grew and some waterways become economically invaluable such as the Mediterranean and later the Northern Atlantic. Together with the commercial use of the sea, the human settlement densified along the shores in straight consequence of the economy.

We can argue in favour of the Gray whale presence in the Mediterranean because of great similarities between California coasts and the studied area. As a matter of fact, we find, in the north-western Mediterranean, shallow lagoons (Camargue, Lattes, Thau, Bages, Salses, Canet and Aïguamolls de l'Empordà) which were opened in antic periods. Those ponds house a variety of Invertebrates, Fishes, Birds and endangered Mammals (e.g. Otter (Medi Ambient (Dpt) 2001) or Beaver).

Concerning Atlantic Gray whale population, we can therefore conclude that the overhunting must have been dramatically important or the population very depressed by another cause for reaching the extinction : e.g. it is well known that Baltic Sea underwent and undergoes biomass crisis more or less related to human activities. The Pacific population dangerously dropped later to probably fewer than 2000 individuals in the 1900's. Protection finally came in 1946 through an international agreement to stop the hunting. Since that time, the population has grown : the abundance estimate resulting from the 1997/98 census is 26,635 (CV=0.1006) whales. similar to what it was before modern-day whaling.

It is therefore ecologically likely that Mediterranean housed Gray whales but does it fit with historical accounts ? The problem is that this whale was only very belatedly considered as a separated species. Earliest witnesses that we can attribute with certainty to Gray whale are from Francis Ulloa in 1539 (about 500 individuals in the Gulf of California), Torquemada in his *Monarchia india* in 1603 where he tells about the Viscaino Baia de Ballenas (True, 1904). But no mention is made about the Gray whale specificity. First North America explorers from 16th and 17th centuries (Rondelet in 1554, Belon in 1551, Lescarbot in 1609, Rochefort in

1658, Du Tertre in 1667,...) never took in account any baleen whale resembling the Gray whale. For example, Du Tertre in his *Histoire Générale des Antilles*, in 1667, talks about whale groups around the *Antilles* and we can exclude Gray whale from that he observed aggressive behaviour between males that is in opposition with Gray whale's behaviour. Then comes Paul Dudley's description (Dudley 1725) :

«The Scrag Whale is near a kin to the Fin-back, but, instead of a Fin upon his Back, the Ridge of the Afterpart of his Back is scragged with half a Dozen Knobs or Nuckles; he is nearest the Right Whale in Figure and for Quantity of oil; his [whale] Bone is white, but won't split.».

Dudley was Chief-Justice of Massachusetts and his assertions are the most significant because they make possible to recognise very easily all the other species he mentions. Here, many anatomic features allow us to rely his whale to the Gray whale : little humps on the caudalmost back, no fin, white whalebone and intermediate shape between Balænopteridæ and Balænidæ. It is the only reliable witness recognising the existence of the Atlantic Gray whale. He was then cited by a lot of other authors such as Anderson, Mayor of the city of Hamburg in 1746 («Knotenfisch» or «Knobbelfisch» or Whale with knots), the Abbé Bonaterre in 1789 (New England *Balæna gibbosa* «the whale with 'bosses'» : once more the semantic proximity – the same could be said about phylogenic vicinity - with the Humpback whale is evidenced), Douglass in 1749, etc…

Other authors refute the existence of a 'Scrag' whale species such as F. Cuvier (Cuvier 1836) whose remarks about Dudley's Scrag whale are that it could not be anything but a Rorqual and that Dudley's is mistaken when considering the osseous nature of the dorsal protuberances. But if we take in account that he rejected the Bowhead as a separate species from the Right whale, we can be doubtful about his arguments. Another author (True 1904) states :

«'Scrag' whale […] is, and always has been, a stumbling-block to cetology. It was accepted, without criticism, as a separate species by Klein, Anderson, and other writers.» and «[…] it is evident that the term 'scrag' is regularly included in the whaleman's vocabulary. That there is a separate species to which the name applies is improbable, but it is still uncertain whether it merely characterises abnormal individuals of the various species or Right whales, or definite varieties of one or more species of Right whales […]. The word 'scrag', of course, means emaciated, ill-favoured, or rough and crooked.»

Finally, some more intuitive authors give new opportunities to the debate. H. Jouan in 1859 states about *B. nodosa* Lacépède : «This is a Humpback, or perhaps a whale that is found in California, which the whalers designate by the name of 'California Grey' or 'California Ranger'». It is the first time an author questions the identity between both Gray whales. That's all the more surprising since Jouan was not a 'Scrag' whale contemporaneous. In that way, the great scientifics Van Beneden & Gervais believe that *Balæna nodosa* is the Dudley's 'Scrag' whale. It is also noteworthy that they say that *Balæna bis-cayensis* does not frequent Mediterranean waters («enter» [sic]) in spite of few but reliable observations (Beaubrun 1995).

To add to the confusion, the British Museum curator J. E. Gray in its Supplement to the catalogue of the Seals and Whales in the British Museum multiplies the possible Gray whales :

«Family 2 Agaphelidae (Scrag whales)

Agaphelus gibbosus inhabiting North Atlantic (from Cope and Dudley)

Rhachianectes glaucus inhab. California (from Cope)

Family 3 Megapteridae

Megaptera americana, osphyia, versabilis

Eschrichtius robustus (inhab. North Sea, coast of Devonshire, Sweden, Atlantic)»

Finally, hereafter are some observations (all from (True 1904) that show the fog that embedded whale species descriptions and could refer to Atlantic Gray whales (broad characters indicates possible Gray whale characteristics) :

«1770. A dead whale was found a quarter of a mile from the beach. […] The whale washed ashore and made **15 barrels**.» (Winsor, J. *History of Duxbury*, 1849)

«In June, 1850, a whale **35 feets** long, was captured in Peconic Bay, near Greenport» (Caulkins, C.A., *Early Whaling industry of New London*).

«On ye East end of Long Island there was **12 or 13 whales** taken before ye end of March [1669] […] ; here are dayly some seen **in the very harbour**, sometimes within Nutt Island.»

«Jan. Y^e^ 16, 1707 (she says) my company killed a yearling whale, made **27 barrels**. […] I had but a third, which was **4 barrels**. […] March 17, my company killed two yearlings in one day ; one made **27**, the other **14 barrels**» (Thompson, Benj. F., *History of Long Island*)

«Upon the south side of Long Island, in the winter, lie store whales and grampuses [the Gray whale is often seen with *Grampus griseus* off western coasts of North America], *which* the inhabitants begin [1635-1650 ?] with small boats to make a trade of catching, to their no small *benefit*» (Hubbard, *General History of New England*).

Also, Eschricht in 1845 in its *Bemærkninger over Cetologiens tidligere og nærværende Skjebne*, taking up the question as to whether the Basque fishery of the 16^th^ and 17^th^ centuries may not have been for Fin whales *Balænoptera physalus*, does not conclude because neither Right nor Fin whales seem to fit some accounts. The *Sardaco Baleac* also is questionning since Gray whale is very gregarious. Finally, we could be surprised by the Gray whale's like feeding behaviour of Humpback on Stellwagen banks off New England (Hain 1995) and we could rise the opinion that it could have been a behaviour learnt from the 'Scrag whale'.

Given these facts we could suggest a migration route for eastern Atlantic Gray whales. Gray whales subfossils have been found (see figure 6) in five localities along northern European coasts (most recent age : 500 AD, (van Deisen and Junge 1937), along eastern coast of North America (most recent radiocarbon date : 1675 AD, after Mead and Mitchell 1984) and probably in Lattes.

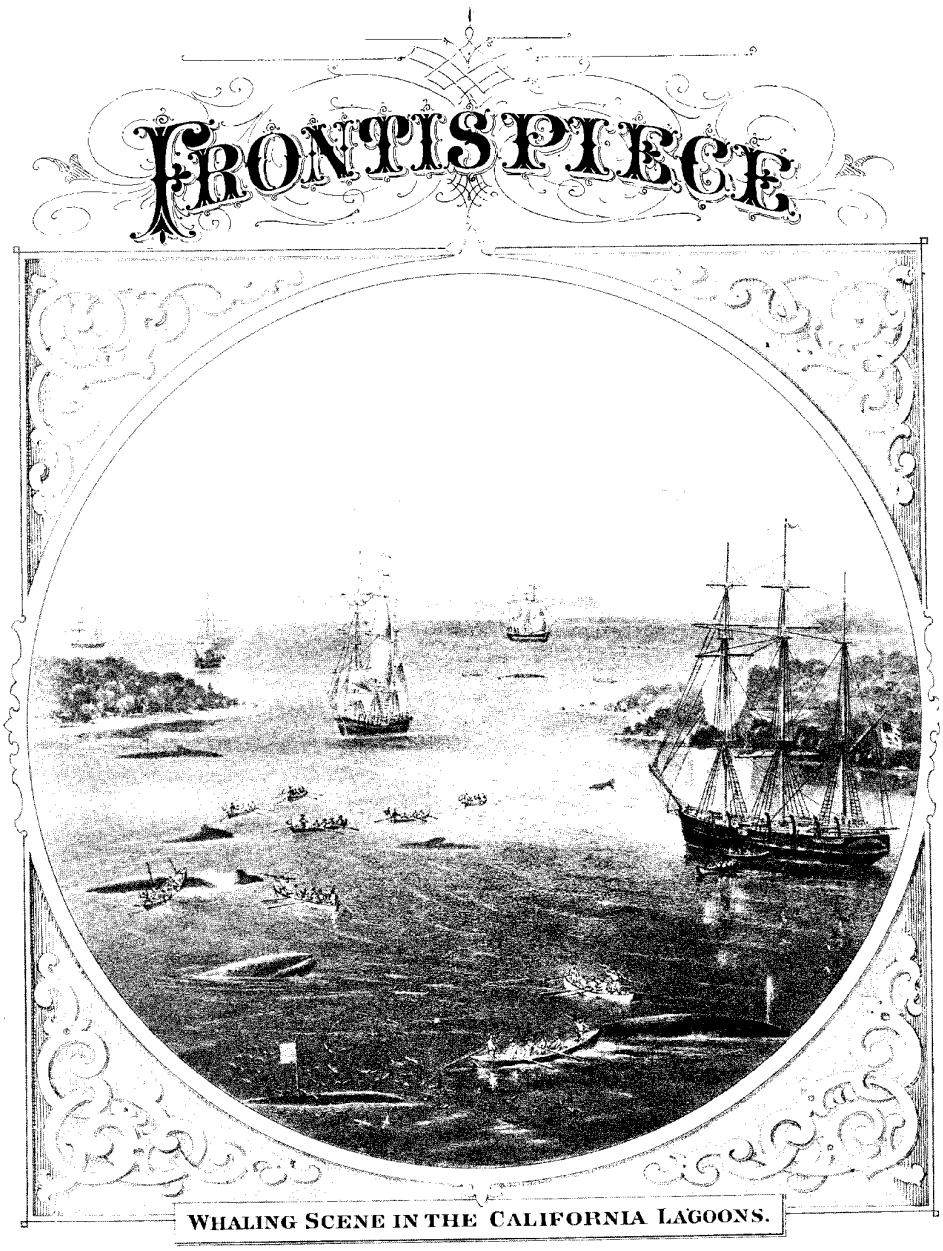

Fig. 7. A whaling scene upon Gray whale in Baja California lagoons in XIXth century, from Scammon 1874.

Thus, we propose the migratory route shown in figure 6. The feeding grounds would have been at least in the Baltic (but why not also in the White Sea ?). Winter calving areas could have been at least in the north-western Mediterranean, according to our results, and with caution on north African coasts as already suggested (Mead and Mitchell 1984) according to climate considerations, and the Gulf of Biscay (Figure 6).

Conclusion

The Fin whale is actually the only common Mysticete species in the Mediterranean and also a very great ecosystem component. An international effort was made to assure its viability (Beaubrun 1998). But it is a epipelagic species and we cannot exclude that another species could have occupied the coastal counterpart ecological niche.

It is not the first time Cetacean are buried out from Montpellier surroundings, as for instance Miocene fossils (de Muizon 1988 ; Serres 1838), but no opportunity was made before for studying Pleistocen or actual fauna.

There are great probabilities that we discovered the first European Gray whale breeding grounds considering from one hand the comparative anatomy and from another hand the ecological similarities between the Gulf of Lion's lagoons and those of Baja California, South Korea and Northern Florida.

Perspectives are opened by molecular biology as all mitochondrion DNA control region sequences have been published for Cetacean (Arnason 1993 ; Macé 1999) and it is therefore possible to identify a whale from its mitochondrion DNA sequence. The greatest difficulty for this scope is the poor or null DNA yield from fossils. The challenge is very important considering the ecological implications.

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